



# Memphis Depot Environmental Restoration Program Main Installation Remedial Action Information

The selected groundwater and surface soil remedy addresses the remediation of surface soil and groundwater contamination, which will allow the transfer or lease of the MI property for its intended land use (industrial and recreational). The selected surface soil remedy consists of land use controls for the majority of the Main Installation coupled with excavation, transport, and off-site disposal of an estimated 7,200-ft<sup>2</sup> area of surface soil at Building 949 (removal action accomplished this portion of the remedy in 2001). The selected groundwater remedy is enhanced bioremediation, which includes land use controls and long-term monitoring.

The major components of the selected remedy include:

- Excavation, transportation, and off-site disposal at a permitted landfill of an estimated 7,200 ft<sup>2</sup> of surface soil containing lead concentrations equal to or greater than 1,536 milligrams per kilogram (mg/kg) near the southeast corner of Building 949. The Memphis Depot completed a removal action at this area in August 2001, so this portion of the remedy is completed.
- Deed restrictions and site controls, which include the following:
  - Prevention of residential land use on the Main Installation (except at the existing Housing Area).
  - Daycare restriction controls.
  - Production/consumptive use groundwater controls for the fluvial aquifer and for drilling into aquifers below the fluvial aquifer on the Main Installation.
  - Elimination of casual access by adjacent off-site residents through maintenance of a boundary fence surrounding the Golf Course.
- Enhanced bioremediation of chlorinated volatile organic compounds (CVOCs) in the most contaminated part of the groundwater plume.
- Long-term groundwater monitoring to document changes in plume concentrations and to detect potential plume migration to off-site areas or into deeper aquifers.
- 5-year reviews of the selected alternatives.

The land use controls (deed restrictions and site controls) that are included as part of the selected remedy provide additional layers of protection above the existing land use and groundwater controls as established by the: (1) City of Memphis and Shelby County zoning regulations; (2) Federal Property Management Regulations; and (3) Ground Water Quality Control Board for the City of Memphis and Shelby County.

These remedial actions will address the following Constituents of Concern:

**Arsenic:** A COC in soil on the Main Installation. Arsenic is an inorganic chemical that occurs naturally. It is released to the environment through metal smelting, combustion, and waste disposal, and as arsenical pesticides. In soils it is relatively nonmobile. Arsenic is found at relatively low levels in many types of food, including seafood, meats, and grains. Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. Long-term exposures to high levels of arsenic in drinking water are known to cause cancers and “black-foot” disease in humans.

**Dieldrin:** A COC in soil on the Main Installation. Dieldrin is an organochlorine compound widely used from the 1950s to 1970s as an insecticide in agriculture, for subsurface termite treatment, and for control

of disease vectors such as mosquitoes. Most uses of dieldrin (termite control was an exception) were banned in 1974 because of its adverse environmental and health effects. In 1987 EPA banned all uses of dieldrin. Dieldrin is a probable human carcinogen. Short-term exposure to high concentrations of dieldrin chemical can cause headaches, dizziness, loss of consciousness, nausea, and loss of appetite. Bound to soils, dieldrin can persist for a long time in the environment. Binding to soil makes it less bioavailable compared to the pure chemical used in the toxicity studies.

**Lead:** A COC in soil on the Main Installation. Lead is a naturally occurring, bluish-gray metal found in small amounts in the earth's crust. It does not dissolve in water and does not burn. Lead has been used commercially in batteries, sheet metal, soldering, ceramic glazes, and paints. Low levels of lead are common in human food, air, and water. Adult exposures to high levels of lead are known to adversely affect blood pressure, memory, the brain, and kidneys, and to cause anemia and blood disorders. Lead is not known to cause cancer in humans. High exposures to lead are toxic to unborn and young children by affecting their intelligence quotient (IQ). EPA regulates lead as a special case using a bloodlead uptake model to determine target concentrations protective of children and adults. At Building 949, lead in soil at levels that presented unacceptable risks for industrial reuse were removed in 2001.

**Carbon Tetrachloride (CT):** A COC in the groundwater of the fluvial aquifer. Carbon tetrachloride is most often found as a colorless gas. It was historically used in the production of refrigeration fluid and propellants for aerosol cans, and as a pesticide, as a cleaning fluid, as a degreasing agent, in fire extinguishers, and in spot removers. Presently, these uses are now banned and carbon tetrachloride is only used in some industrial applications. Exposure to high levels through inhalation, ingestion, and possibly skin contact, can cause liver, kidney, and central nervous system damage. In severe cases, coma and death can occur. Carbon tetrachloride may reasonably be anticipated to be a carcinogen, however it is inconclusive.

**Tetrachloroethene (PCE):** A COC in the groundwater of the fluvial aquifer. PCE is most commonly used for dry-cleaning textiles and for metal degreasing. Occupational exposures are most common among workers at dry cleaning facilities. High exposures can cause effects on the central nervous system, leading to dizziness, headache, sleepiness, confusion, nausea, and difficulty in coordination and speech. Exposure of PCE at high levels (considerably higher than detected at the Depot) can cause unconsciousness and death. In animal experiments with exposure to long-term higher-than-typical environmental concentrations, PCE is shown to cause liver and kidney damage, developmental effects, liver cancer, and leukemia. Based on animal evidence PCE is presumed to be capable of causing cancer in humans, however, human exposure data do not conclusively indicate that it is carcinogenic.

**Trichloroethene (TCE):** A COC in the groundwater of the fluvial aquifer. TCE is a halogenated organic compound used historically as a solvent and degreaser in many industries. Exposure to this compound has been associated with deleterious health effects in humans, including anemia, skin rashes, diabetes, liver conditions, and urinary tract disorders. Based on laboratory studies, TCE is considered a probable human carcinogen.

## References:

Agency for Toxic Substances and Disease Registry. ToxFAQs. [www.atsdr.cdc.gov/toxfaq.html](http://www.atsdr.cdc.gov/toxfaq.html)

CH2M Hill. *Main Installation Proposed Plan*. August 2000.

CH2M Hill. *Main Installation Record of Decision*. Section 2.7.1. February 2001.

CH2M Hill. *Final Main Installation Remedial Design*. Sections 2.3 and 2.4; Appendix A Table 1-1 and Section 4.7.3. July 2004.